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ABSTRACT

Forty-four junior high school students were randomly assigned to two vocabulary instruction treatments. One treatment used context-rich, three-sentence passages as sources for target word definition. The other, the semantic mapping treatment, entailed learning new words by identifying the similarities and differences with related, known words. Results indicated significant main effects favoring the semantic mapping treatment on average weekly test scores, posttreatment test scores, and a standardized measure of general vocabulary knowledge. These findings suggest that focus on word features in related, known words may be an effective method for teaching new vocabulary. (Author/RL)

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The Effects of Instruction Using Semantic Mapping on Vocabulary and Comprehension

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Vocabulary expands rapidly during the school years (Anderson & Freebody,Note 1); it is a mark of increased knowledge and learning. Instruction in vocabulary is considered a critical component of teaching in most content areas, most notably, perhaps, in reading. Petty, Herold, and Stall (1968) reviewed a large set of vocabulary studies and found that direct vocabulary instruction did, indeed, lead to greater general vocabulary knowledge, although no one method of instruction was found to be superior to others.

Direct vocabulary instruction may be particularly important for upper grade low readers for whom English is a second language. Such students have limited exposure to the rich experiences more successful native English speakers have with both oral and written language. At this level of schooling, moreover, as the demands for and benefits from intensive reading increase, vocabulary deficits may become progressive unless an effective intervention plan is initiated (Becker, 1977). The purpose of the present study is to compare the effects of two direct vocabulary instructional methods on the word learning of low reading, Hispanic background seventh and eighth graders.

Vocabulary knowledge is, of course, highly related with reading comprehension. Word meaning factors account for a large portion of comprehension variance (Davis, 1971; Spearritt, 1972). However, such findings do not clarify what are the causal links between learning vocabulary and increased comprehension. Another purpose of the present study is to test which, if any, of the vocabulary methods positively influence comprehension. In this way, through inference, it may be possible to learn more about the vocabulary/comprehension relationships.

Nelson (1979) proposed a model to account for conflicting theory and findings in the study of word meaning, concept, and category acquisition. Young children learn concepts from real world experience through experience with object function and through action upon objects. Concepts are categorized on the basis of function and expanded with examples. Schooling, experience with object groups and language structure, and advancing cognitive ability presumably help children organize categories into hierarchial systems with superordinate lexical items. Thus, real world knowledge and language ability are integrated. Anglin's (1970) data indicates that categorization is most often the source for recall through the school years, suggesting that categories increasingly take on heuristic value. This model suggests that upper grade poor readers might be facilitated more by an approach which focuses attention on the relationships of items within a category than by an approach which does not focus on lexical item relationship.

One approach to teaching vocabulary directly is through semantic mapping, which, as described by Pearson and Johnson (1978) is a method for tieing a new word into a network of known, related words by making explicit what are the shared and the unique features of the members of the word group. Operationalized for the the present study, the semantic mapping treatment involved study of words as follows: the target word solitude, for example, was taught in relation to the more familiar words alone, lonely, and quiet. The students and teacher discussed the similarities and differences in the meanings of the known words. The meaning of the target word was established through selection of how it was similar to (peaceful aloneness) and different from the related words (not negative as in lonely). This approach is easy

to use in classrooms, requiring only the selection of related, but more common items and the identification of similarities and differences among them.

The other method tested in this study was the use of context to describe the target word. Context information in written discourse is likely to be at least somewhat important to general vocabulary expansion. When a reader meets a new word, the meaning might become apparent with careful analysis of surrounding information and use (Wittrock, Marks, & Doctorow, 1976). Repeated contacts in different contexts are thought to broaden understanding. Specific discourse clues such as the syntactic role of the word, definitions embedded in the discourse, comparisons with known words, synonym provision, the use of familiar expressions, and summaries may be helpful; teachers are advised to teach their use (Harris & Smith, 1976).

The survey by Petty et al (1968) did not, however, suggest that context methods were superior to other methods. Since that review, however, some evidence suggests that rich context, context with considerably more word meaning information than is likely in normal text, does provide students with potential for word learning, compared with other methods. Gipe (1979) and Gipe and Arnold (1979) reported a study in which third and fifth graders benefited more from such a method than through study of word association, category study, or dictionary study. (Category study involved the listing of category members without explication of member similarities and differences.) The context method presented each target word in three-sentence passages written so each sentence contained the target and one contained, in addition, a definition. Context was operationalized similarly in the present study.

Although the context method appears fruitful, Gipe (Note 2) has recently reported that the findings did not replicate. Moreover, context has been

shown to be less effective than the key word identification approach (Pressley, Levin, & Miller, 1981).

Kent (Note 3) recently surveyed six basal reading programs and found that, to a large extent, they focus attention upon context more than other approaches as a means to increase vocabulary knowledge. Her small sample of teachers viewed vocabulary building as important but not supported enough in basal reading programs, a view shared by others (e.g. Becker, 1977; Stotsky, Note 4).

Because of its accepted place in education, this commonly used approach to vocabulary was selected to compare with semantic mapping. Each group received instruction on the same words. Additionally, the context treatment subjects were presented the same words in the passages that were used in the category for each target word in the semantic mapping treatment. We therefore made every attempt to equate the information the two groups received except for the essential, differentiating features of the methods.

We predicted that the semantic mapping treatment would produce higher scores on all measures than the context treatment. This prediction was based on the focus on the relationships among category items in that treatment, a focus we thought of particular benefit to low-achieving second language users whose linguistic control of hierarchial structures may be low.

Five dependent measures were used to test our hypothesis: cumulative knowledge of the taught words during the treatment; the retention of words tested in the familiar treatment format at the conclusion; retention at conclusion in a different format; vocabulary knowledge from a standardized test; and comprehension from a standardized test. These measures would enable us to interpret the location and extent of possible benefits on learning.

Method

Subjects

Forty-four seventh and eighth grade students (28 female, 16 male) who were from a parochial school in a Mexican-American community where the Spanish language predominates participated in the study. Mean reading scores from the school-administered Iowa Test of Basic Skills (1971), administered six months prior to the treatment initiation were, in both groups, at a 6.7 grade equivalent. Participants were assigned to treatment groups randomly; 21 were in the semantic mapping group and 23 were in the context clue group. (Two students in the semantic mapping were lost due to relocation and illness.)

Treatment and Design

Both treatment groups were presented the same three words each of three days a week (16 minute sessions) for eight weeks by the same teacher. Both groups received a weekly test of the words presented in a format like that in which the words were taught. The 71 target words were selected from The Living Word Vocabulary (Dale & O'Rourke, 1976) by being picked randomly on the basis that they were known by 68 percent of tenth graders but not by younger students. Examples of words were: brutish, pitfall, shrewd, solitude, denounce, bouyancy. The Dale and O'Rourke list includes 43,000 entries, (multiple meanings coded and tested separately) which have been validated through simple testing of an unidentified number of students.

The semantic mapping group participants studied each word in connection with three words that had similar and associated meaning, were simpler in meaning, and were assumed to be familiar to the students. These three words were included to explore the related meanings among the members of the

category. For example, for the new word, solitude, the students learned its meaning through discussion of these three simpler, related, and assumed familiar words: quiet, lonely, alone. These words would, through artful questioning, provide clues to the meaning of solitude. Questions asked were: "What does it mean to be alone? How does being alone differ from being lonely?" The discussion continued until all three words were defined (a brief phrase definition in the students' words). The students were then asked to predict the meaning of the new word. The discussion of the known words enabled them to identify the shared meaning among the category members. Differences between the target word and the other items were identified and discussed so that a definition of the target word could be arrived at. When the meaning was not forthcoming, in a few instances, a dictionary was consulted. The dictionary definition was then discussed in terms of the related words of the semantic cluster. For solitude the arrived-at definition, like the others, was written on the board: "to be alone but not lonely."

The Weekly test for the semantic mapping group requested that students match the new words to their short meanings (identical to the meanings established during the instruction). Thus, for example, at the conclusion of the week in which solitude was presented, the students were asked to match solitude with the correct meaning chosen from the nine different items of the week's words.

The context clues group learned the same words in the same amount of time with the same teacher as follows: They were provided short, simple explanatory paragraphs in which clues were given as to the new word's meaning. These clues corresponded to items the mapping group received for building

the associations. In the paragraph below about solitude, for example, one can identify the word clues, alone, lonely, and quiet.

> Everyone needs moments of solitude. Solitude is to be alone but not necessarily lonely. One can enjoy moments of solitude because it is a chance to be alone and quiet.

The participants read each paragraph silently as the teacher read them aloud, thus eliminating potential reading difficulties. At the conclusion of the reading, the meaning of the target word was discussed and written on the board. Thus although the subjects in this treatment apparently had the same information as those in the semantic mapping, they lacked the information provided by the discussion of similarities and differences among terms in the categories in the latter treatment. On the other hand, the paragraphs demonstrated a rich syntactic and semantic setting. As in the semantic mapping treatment, the Weekly test presented items that would clue the instruction. That is, for the context clue group, a modified cloze procedure was used with wording like that of the paragraph in which the word was presented. For solitude, the item was "Everyone needs moments of _____." To help the students, the nine words that had been presented in a week's time were listed at the bottom of the Weekly tests for selection purposes

The average scores from the Weekly tests in both groups provided information about the successive effects of the treatment throughout implementation. Such data would permit verification of the treatment with a direct measure of short-term retention.

Measures

Pre- and post-treatment administration of the Gates-MacGinitie Test, Level E, Form one (Gates & MacGinitie, 1978) provided scores to determine the overall effects of the treatments. The Vocabulary Subtest post-treatment scores would indicate the generalized effect on vocabulary knowledge since subjects would be tested on a different set of words. The Comprehension Subtest would indicate the generalizeability of vocabulary increase, if any, on comprehension.

In addition to the tests of the treatment through standardized reading tests, two post-treatment tests were developed. One, the Treatment Test, was a test like the Weekly tests in that the format was similar to the instructional method for each group. On the 18 item tests (words selected randomly from the set of 72 words taught) given each group, the format was identical to that used in the respective Weekly tests. This test was a post-treatment test, the Definition Test, required the students in both groups to define 36 randomly selected words through writing. Thus, this test differed in format from the separate Weekly and the Treatment Tests.

All of these tests provide information about one basic hypothesis. However, they probe the hypothesis at different points during and after the treatment and at different levels of generalizeability. In order to rely on the study findings, we would hope to find consistent results across the Weekly tests, the Treatment Test, the Definition Test, and the standardized tests of vocabulary and comprehesnion.

Statistical Analysis

Multiple regression was the basic data analytic procedure employed. In analyzing average Weekly test scores, the Treatment Test Scores, and the

Definition Test scores, a combined Gates-MacGinitie test score (consisting of the pre-treatment Vocabulary plus the pre-treatment Comprehension scores) was treated as a covariate. Each of these three dependent measures was then individually regressed on the pre-treatment combined Gates-MacGinitie score, a dummy variable representing experimental condition, and an interaction term created by multiplying the combined Gates-MacGinitie score by the experimental condition dummy variable. A similar approach was used in the analysis of the post-treatment Gates-MacGinitie Vocabulary and Comprehension subtests scores. The exception was that in analyzing the post-treatment Vocabulary and Comprehension scores, the pre-treatment Gates-MacGinitie Vocabulary and Comprehension scores were used respectively as covariates.

In each regression analysis, variance in the dependent measure was decomposed according to a hierarchial approach suggested by Overall and Spiegel (1969). The main effect was adjusted for the co-variate and the interaction term was adjusted for the covariate and main effect.

Results

Table 1 presents descriptive statistics for each treatment condition on pre- and post-treatment tests. (Despite some subject attrition, there were

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Insert Table 1 about here

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only chance differences between treatment groups on the pre-test Gates-MacGinitie Vocabulary and Comprehension subtests scores.) Table 2 summarizes the results of the multiple regression analyses. As Table 2 indicates,

significant main effects were found on three of the five dependent measures

Insert Table 2 about here

that were addressing the study hypothesis. After adjusting for the respective covariates in each analysis, the semantic mapping group demonstrated significantly higher (at least $p < .05$) scores on the Weekly Tests, the Treatment Test, and the Gates-MacGinitie Vocabulary Subtest compared with the context clue group. The group differences observed for the Definition Test and the Gates-MacGinitie Comprehension scores were in a consistent direction with the other dependent variables but were not statistically significant.

Table 3 shows adjusted means and effect sizes for significant treatment effects.

Insert Table 3 about here

The adjusted, rather than the unadjusted means were used in computing the effect sizes in order to take into account pre-treatment group differences in general vocabulary and comprehension knowledge.

While the semantic mapping treatment showed significant main effects over the context clue condition, there is some marginally significant evidence to suggest that the magnitude of the semantic mapping condition effect depends upon the participants' level of pre-treatment reading achievement. The composite Gates-MacGinitie score X experimental condition interaction was significant at $p < .08$ for the Weekly Tests and $p < .06$ for the Treatment Tests. A further investigation of these interactions, however, indicated that substantial numbers of subjects in the semantic mapping condition scored 100% on the Weekly or Treatment Tests. This may have produced an artifactual interaction due to a ceiling effect for the semantic mapping condition. Because of this possibility and the fact that the interactions were only marginally significant, we are reluctant to interpret them substantially.

Conclusions and Discussion

The purpose of this study was to determine if a semantic mapping vocabulary approach would be more effective in influencing vocabulary and comprehension than a more typical procedure, context clue provision. The study employed various measures of vocabulary growth and comprehension. The measures tapped vocabulary growth during and after the experiment. They included two tests similar to the treatment and also measures of more general effects of vocabulary and comprehension. On three of the five dependent measures (Weekly Tests, Treatment Test, Gates-MacGinitie Vocabulary Test),

the semantic mapping treatment produced significantly higher scores than the context clue condition. The Weekly Test measured on-going short term retention. The Treatment Test also measured retention of the treatment-specific content. These first two measures, then, verified that retention of vocabulary items, both during and after the treatment, was greater in the semantic mapping condition. Furthermore, the finding for the Gates-MacGinitie Vocabulary subtest suggest that these benefits may extend to general vocabulary knowledge. The results of the Definition Test and the Comprehension Subtest of the Gates-MacGinitie were in the same direction but were not significant.

It would appear that semantic mapping has a greater positive impact on both specific and generalized vocabulary acquisition than does the context clue approach. The pattern of effect sizes found suggests that the effects may be strongest for the measures of treatment-specific vocabulary content, somewhat less strong in regard to general vocabulary, and not strong or statistically reliable in regard to general comprehension. Because of no clear pattern in regard to comprehension, this study sheds no light on the vocabulary/comprehension relationship.

The results of the study suggest that students such as these acquire greater vocabulary knowledge through a semantic mapping approach than in a typical context approach.. Specifically, these students responded well to the focus of attention on similarities and differences among items in a category. The approach may heighten students' categorical knowledge which may in turn, increase their use of the structure for recall, as suggested by Nelson's (1978) model. Of course, more fine-tune testing is required

for validation of the model. Additionally, it would be valuable to test the semantic mapping procedure with native English speakers at different levels of development to investigate whether the approach is generally beneficial or it beneficial only at certain, possibly immature, levels of language learning.

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Table 1

Descriptive Statistics for Each Experimental Condition

Variable	Context Class Groups (n=23) Mean	SD	Semantic Mapping Group (n=21) Mean	SD
Pre-Treatment Gates-MacGinitie Vocabulary Score	20.17	6.79	19.86	6.53
Pre-Treatment Gates-MacGinitie Comprehension Score	25.22	6.18	24.25	6.59
Average Weekly Test Score	84.04	10.49	90.76	9.65
Treatment Test Score	45.65	26.85	73.81	15.64
Post-Definition Test Score	50.70	11.98	54.48	9.91
Post-Treatment Gates-MacGinitie Vocabulary Score	20.83	7.74	23.05	6.16
Post-Treatment Gates-MacGinitie Comprehension Score	27.13	7.40	27.90	5.25

Table 2

Multiple Regression Summaries

Source	Average Weekly Test Score Var.	df	F	Treatment Test Score Var.	df	F	Post-Definition Test Score Var.	df	F	Gates-MacGinitie Vocab. Score Var.	df	F	Gates-MacGinitie Compre. Score Var.	df	F
Combined Gates-MacGinitie Vocabulary and Comprehension Score (A)	.251	1	17.40**	.214	1	20.38**	.149	1	7.35*						
Gates Vocabulary Score (B)										.705	1	113.25**			
Gates-MacGinitie Comprehension Score (C)													.564	1	55.70**
Experimental Condition (D)	.123	1	8.53**	.325	1	30.95**	.038	1	1.87	.032	1	5.14*	.014	1	1.38
A X D	.049	1	3.43	.041	1	3.94	.002	1	0.12						
B X D										.014	1	2.20			
C X D													.017	1	1.69
Residual	.577	40		.420	40		.811	40		.249	40		.405	40	

*p < .05
**p < .01

Note: Var. = Unique Variance Increment (R^2 increase)

Table 3

Adjusted Means and Effect Sizes

Dependent Variable	Mapping Condition	Context Condition	Effect Size	Percent Improvement
Average Weekly Test[a]	91.08	83.75	0.699	25.5
Treatment Test[a]	74.56	44.96	1.102	36.4
Definition Test	54.73	50.46		
Gates-MacGinitie Vocabulary Score[a]	23.20	20.69	0.324	12.5
Gates-MacGinitie Comprehension Score	28.30	26.77		

[a]Difference between adjusted means significant at $p < .05$